

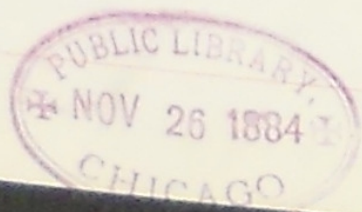
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to my associate students in Chicago Medical
College who may choose to read this essay, as
an example of what we may see everywhere,
by having our eyes open to surrounding
objects, even among such common things as the
well known "chinese bug" (Lygæus leucoptera), it
found "worthy" of a place among the
"archives" of the college, by our beloved
and most esteemed Professors, from whose
lips we together have received the most
invaluable treasures of their immortal
science

Chicago Jan 30, 1886.

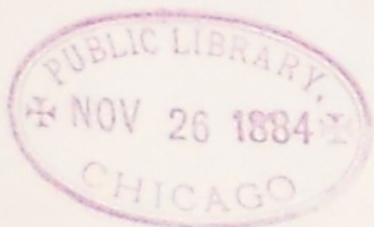
H. L.



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Epidemic Diseases
By
Henry Thimer
Mount Candl
Candl Co.
Illinois



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Chapter First
Epidemic Diseases

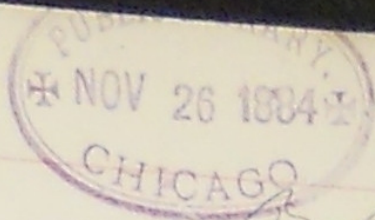
As Manifested in the
Animal Kingdom

Principally derived
from personal observation
of the late Malignant
Epidemic. among
Insects,



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Lecture First

Preliminary Notice of Pygmaeus Leucophaea
in health, and disease.

It may seem strange
to some that men would
stoop to observe the frail crea-
tures of the earth that creep
beneath our feet.

But they are the subjects
of the same unerring laws
that contrall the Lords of Creation
and we may be enabled to draw
from humbler sources, the truths we

fail clearly to see in the image
divine in human form.

Truth from every source is
worth recording. and he who
adds but an atom, to the
already vast accumulations
of the "Hall of Science"
if he does not earn a name
that will place him in the
front rank of human benefact-
ors. Still is doing better than he
who indifferently folds his arms,
regardless of what yet remains to.

be done, or fearing to launch
forth in the shadows of the
towering mountains that the
giant men of Genius have
upheaved before him, or still
more to be nettled, ignorant of
the fact that all has not yet
been accomplished. As the
car of observation rolls on
new truths will continually
break forth upon the astenis-
hed vision of its passengers
throughout the countless ages of

Eternity. Continuing in one
uninterrupted Stream to Perfect,
the unfaiding bliss of him who
is so fortunate as to secure
a papage.

Epidemics among men
are heard of far and wide
and while we discuss the
probabilities and endeavour
to profit by the facts, a tremble
if perchance it even directs
its course towards us. as
When the late much dreaded

Cholera. in its westward
march across the Continent
of Europe was again found
on our own shores. Let us
not fail to observe the fact
that Epidemics an hundred-
fold more terrible to its victims,
than the Cholera, or the Plague
has ever been to man within
historic times, are actually
raging among the humbler
inhabitants of Earth. beneath
our feet. and having observed

the fact. let us endeavour
to inquire into the cause.
And if as Students of Medicine
we would not be auth-
orized to investigate it for
its bearing upon Science in
General. yet we may be
permitted to examine that
part of the Subject that
has a Connection Compar-
atively with the Causes of
death that are universal
Among not only men but

all organic beings. And as
all flesh is heir to the same
Common fate and Univer-
sal ruin, we may hope to
draw some profitable lesson
even from this humble
source

And as if among men
we would profitably inves-
tigate the various Phenomena
& disease, we must first
acquire a knowledge of health,
so in the subject of our present

Esay, we must inquire into
the conditions of health, before
we are prepared to inquire
into the Cause of the disease
which is the principal object
of our remarks.

Then we would beg that
higher grade of Medical
men who study only for
the prospect of future gain
or popularity, who study not
for the love of it, and no
more than they actually must

to secure them business; to
hermit us in our humble
way to attempt to retire
behind the dingy curtain
of scientific obscurity and
follow the diminutive object
of our present subject
into its native retreats.
Where in the full vigour of
its development, it so far
encroached upon the domain
of even the most unscien-
tific and careless observer,

as to become an object of
universal comment and
hopeless denunciation espe-
cially among those who, as
agriculturalists were directly
affected. The forbidden
ground once passed May
we not then as practical
men and as Pathologists
all profit by the humilia-
tion, which we trust may
be drawn from this lowly
source.

With the wide spread
destruction that followed
the rise and progress of Pygmaeus
Leucopterus Say, (Rhypharochismus
Devastator LeBaron) most Western
men are well, and many
in pocket sadly familiar.
Under the Genial influence
of a favourable climate it
attained the maximum
of its development in the
Summer of 1864. Whence
threefourths of the Wheat and

one half of the Corn Crop
was destroyed throughout
the entire North-West with
a loss of more than \$100,000,000.
in the currency that then
prevailed. Which if contin-
ued at this rate for 100
years. and estimating
the value of money at the
legal rates of our state,
Annually, would amount
to the enormous sum of
137796 Millions of dollars.

lop to the farming Community alone without estimating the effect of this lop upon the various associated interests of the Nation, and with its tendency rapidly to spread over the entire Continent. With these combined interests and a rapidly developing Country, it even would be short of the true estimate to place the entire lop to this

Continent at one hundred
times that Sum. if thus
perpetually continued without
interruption. — a Sum
sufficiently vast to engulf
the wealth of the world.
This short digression from
the Pathological Consider-
ation of our Subject, may
be excused for the purpose
of illustrating the aggre-
gated effect of so small
and insignificant a

Creature. Scarcely worth
the consideration of a Man".
And at the same time
showing that all epidemics
are not deleterious to the
interests of man.

Its ravages have been
marked with varying
paroxysms. From year to
year for a long time.
Among the records of which
it will be seen that
Mr B. Walsh of Rock Glanagh,

estimates the loss in Illinois
alone in the year 1850 to
have been \$4.000.000.00 And
from all insects of every
kind at \$20.000.000.00 in Gold.
What fatality produced the
intervening paroxysms.
in its progress and devel-
opment, it was not my
province to observe

The pleasant dry weather
of the few years preceding
1865, which was exceedingly

healthy for every description
of animal life, in a state
of nature, and the unob-
structed herds of our prairie
climate. And the snowy pro-
tection of the winters, intro-
duced into the fertile
prairie fields of the North
West, an unusually large
and healthy generation of
them in the full vigor of
their reproducing powers,
and the harvest men found

them in every field. in
unnumbered millions. in
the summer of 1864. blas-
ting the fairest prospects
of the bone and sinew
of the land. It weighed
down the prospects of the
farmer. upon whom all
other interests rest as a
firm foundation. alth-
ough Seldon observed and
rep frequently acknowl-
edged.

It was my fortune to
observe them in their devel-
opment, for years, following
them by daily observations
and to see the mature
generation of midsummer,
fulfill the great office of
nature, and lay down
to die from natural laws
after the great object of
their being was accom-
plished, in the midst of
their rapidly developing.

offspring, uncared for
and mostly unobserved.
Day after day it was my
greatest pleasure in a
scientific point of view,
while I deplored their de-
vastations, to mark
the continual progress of
this vast host towards
the imago state everywhere
around me; which with
the counteracting influences
that other insects exerted

occupy pages of recorded
observations of the great-
est interest to me. Which
however would be foreign to
our present purpose.

Having thus seen them
developed. And in full and
vigorous health at the close
of autumn. I saw them
choose their various local-
ities of shelter where they instinc-
tively contemplated braving the storms
of the coming winter.

With the closest attention
 I failed during the entire
 Summer to observe any
 agency, that in any way
 operated against the increase
 and progress of these insects
 except some of the carnivorous
 insects and birds, among the
 former. The Coccinillidae
 especially. Hippodamia Maculata
 and the Crysope of which a
 new species that I described
 as C. Illinoensis Proceedings
 C.

Entomological Society Philadelphia
were very active in their efforts
of subjugation as well as
abundant, doubtless proving
a source of great annoyance
to them, and from their
great numbers and voracious
tendencies led to the belief
that under favourable cir-
cumstances they would do
much towards restraining
their progress. Still their
immediate effect on the

vast multitudes of the
L. Leucoptera that literally
covered the stalks and blades
of corn during the day and
the ground at night was
not appreciable to the casual
observer. Neither the heat of
the sun, the drenching
rains when they did occur,
which was but seldom and
then only in brief showers,
nor the cold frosts of autumn
made any unfavourable

impression upon them
The hottest and driest
weather. So long as they
could obtain food was
their most favourable element,
it was only at midday of a
high temperature, and in
fair weather that we saw
the imago on the wing,
and then at midsummer
after the maturity of the first
or spring brood, the air swarmed
with them, not in

congregated clouds like
the flight of the locust, but
scattering all through the
air every where. probably about
a score of them to the cubic
foot. Sporting in the sunshine
and seeking their mates
and favorable grounds &
pastures where they could
fulfill the first great law
of all organized life - to
propagate their kind. It was
quite remarkable too to see

them thus soaring and
dancing so joyously on their
frail four winged support, in
the full vigor of insect health
pleasure and enjoyment,
like moats in the atmosphere
each one enjoying in this
their season of love, a world
of inward, emotional pleasure
Interesting to the farmer
because this unusual phen-
omena induced him to
believe that they had taken

Wings to fly away. for in the
harvest season then just
passed they were never seen to
take wing to escape the most
eminent danger, as they
heaped upon the platforms
of the reapers by the bushel.
Interesting to the natu-
ralist, because in this season
of their activity he beheld
the conditions necessary to
their fullest development and
highest enjoyment.

When this their season of
courtship was ended it was
farthermore interesting in a
scientific, though not in a
pecuniary point of view, to be-
hold the nuptial embrace
and all absorbing interest
that they manifested in the
act of oviposition, all in
the highest seeming enjoyment
of health, and indeed it was
impossible to find any dead
or dying. The ovipositing

Season ended at the time
when the first laid eggs
began to hatch, when with
few exceptions the parents died
leaving the carefully selected
pastures entirely to their off-
spring. Neither during the
entire season of youth could
we find any of the young
dying of disease. The weather
was unusually warm and
dry. A condition that was
the most favourable for their

full enjoyment of health
They skinned themselves
three or four times in their
progress from the larval to the
pupa state. and it was
this circumstance that lead
many uncertain observers
to believe that they were
dying. especially the spring
brood. where they were at such
moulting times. particularly
when casting off the pupa
garment. that they were

often found congregated
together in bunches often of a
pint or even of a quart or
more fulfilling the last office
that perfected their being,
in their youthful pulchery
they came fourth white or
pale red soon to harden
and blacken in the sun
leaving their cast off garm-
ents lying in piles. Among
these piles I could detect
none of the dead supposed

to have been observed by
many

We will now pass what
we further saw of them in
their progress and development
to make a few observations
on their life during the
winter recording such facts
as may seem connected with
our present consideration,
especially connected with the
visible manifestations of
health and endurance.

before we proceed to the investigation of the Physiological and Pathological Conditions that produced their almost entire overthrow.

In January 1865 I examined those that had chosen their winter quarters in the sheaths of the corn leaves. Such as were above the snow, and had been thus exposed. during the severe cold weather of December With the Thermometer.

D.

15° to 20° Foh. below zero,
were all dead. from the effects
of the extreme cold. As the
winter advanced I occasion-
ally brought in corn husks
filled with ice upon thawing
them found the insects all
alive and able to run well
and apparently unaffected
by that degree of cold. many
entirely encased in solid ice
It will here be observed that
they possess vitality enough

readily to withstand the effect
of a temperature below the
freezing point and perhaps
near zero. which must have
been their condition in those
ice bound husks; but when
in the open air exposed to the
sweeping prairie winds 15° - 20°
below zero for a long time
they succumbed to the cold.

March 7th. — The snow having
cleared off from the ground
I examined the condition of

a host of them that had
Chosen for their winter covering,
Ced wood sticks lying on the
ground, entirely surrounded
by frost and ice of these 20 per
cent were living. Of these I
haced a number in more
comfortable quarters in the
house, but was surprised
after one month to find
them all dead. While those
that remained out haced
the month of March without

any farther injury.

Those that had selected more eligible retreats fared much better during the winter, from the fallen leaves of an apple tree I found over 50 per cent of them alive and well and able to travel so rapidly that I experienced some difficulty in being able to count them before they could make their escape. as they were warmed to activity around the stove.

From a single hand-full
of these leaves. taken up
without selection & counted
355 living & 312 dead.

The entire month of March
was extremely variable, alter-
nating almost daily with
rain, snow, freezing and
thawing, seeming to be very
uncomfortable for any
living being. to remain out
of doors on top of the ground
with so poor a shelter.

but from the First to the
10th of April when I
again examined them I
found about the same propor-
tion of living S. Seueoptera

At this time they were
leaving their winter quarters
to seek food.

May 16th 1865 I observed
the same phenomena that I
had occasion to note last
Summer — the Spring-nup-
tial season. They were very

numerous filling the air
in the same way as they
did last summer. and
appearing almost as nu-
merous, spouting in the
mild atmosphere and
brilliant light of the Sun
at meridian height of that
unusually beautiful Spring day.
(More intelligent beings might
learn here a simple, nat-
ural and profitable lesson
from these minute Insects,

that conduct their Courtships
under the searching gaze of
the noon day Sun. instead
of the (midnight hour)
Two days after this I saw
them in great numbers in
the wheat fields — their fa-
vourite pastures and breed-
ing grounds. From this time
on I closely watched with
the deepest interest the
progress of Generation, as
under the most favourable

Circumstances of fine dry
weather it was conducted.
This occupied one month
during which time I observed
much in the highest degree
interesting and new to the
more inquirer after the nat-
ural history of the insect,
but as this is not the object
of this paper, I must withhold
them as foreign to my present
purpose and tedious to those
who may read this Essay.

From June 10th — 17th the
young appeared in great
numbers, with all their char-
acteristic activity, and the
parents having completed the
last great object of their life
died quietly on the field of
their labours.

During the last of June
all of July and August
it was ~~very~~ rainy. The greater
portion of this time the
atmosphere was very cold

and damp, toward the
latter part of July the
insects approached the period
of their maturity, it was at
this time that I first saw
the effects of disease among
them. About the first week
of August the epidemic
was at its height. they died
with the most amazing rapi-
dity, far transcending
anything recorded relating
to the plague, cholera or any

the scourge among men
and animals since the world
began. At length the weather
became warmer, but still
continued wet. The plague
still rages among them with
unabated fury: the dead
on every farm not only
amounting to hundreds
and thousands but innu-
merable millions. inasmuch
that it became a matter
of common observation

among the farmers. Who frequently spoke of their dying, many not inquiring into the cause further than to rejoice over their ruin, others referred the malady to a direct divine interposition. A medical man of great reputation said that the "waters were medicated" for the purpose by some unseen hand. another that it was Cholera. while many ridiculed the idea of inquiring after the cause,

Thus the fearful Epidemic
Raged not only decimating
the ranks of the immense
hosts, then numerous as
the "lice of Egypt," during the
"plagues of Pharaoh", but
continuing unabated
untill, the first of September,
when it was difficult to
find any of them remain-
ing alive. The disease
attacked them first on
level low wet ground

In the latter part of July
in such localities they
were all dead, and the
disease spreading with
alarming rapidity on
the hills and high Prairies
All ages suffered the same
fate. larva, pupa, and imago
all suffering apparently
from one common malady
— involved in the same
terrible epidemic, "uncared
for", "unattended", "without

Medical aid". — engulfed
in one common vortex of
irretrievable ruin. And so
far as I have been able to
learn but one man in
the entire North West
paid them the "daily visit"
of a mile a more.

They died without having
prophogated.

On the first of October
when I was obliged to leave
the locality of my observations

it was exceedingly difficult. after hours of the closest search to produce one alive.

Section Second Etiology & Pathology

In endeavouring to inquire into the cause of this great Epidemic we find ourselves entangled in a maze of difficulties

The minuteness of our objects precludes the possibility of the usual methods of Diagnosis

practiced among men and
the superior animals.

But reasoning from
what we know we must
conclude that the causes
of death in every division
of the animal ~~Kingdom~~
are referable to natural
laws, and may be arranged
under two principal heads.

First:— Causes of death
from a healthy, quiet term-
ination of all the functions of
life. In old age

Second:— Causes of death
from disease.

Which for our present
consideration we may be
permitted to arrange in
the following manner,
not as a Scientific clas-
sification of disease in
general but for the purpose
of briefly considering the
Cause of the Epidemic
under consideration.

Diseases of Animals.

First:— from causes acting
from within.

Of Form & Function

Imperfect equilibrium
of the Physical organization
and vital functions,
Either hereditary or as
acquired by the indi-
vidual, passively.

Exceptions

Anetites. Papins. and
imperfections acquired
actively.

Secondly, - from causes acting
from without.

Social Causes.	{	From Enemies
		Deficient food.
{	Perverted food.	
	Poisons in food.	
	Warfare.	
	Animal Poisons.	

Climatic Causes	{	Vaporized	{	Mineral.
		Poisons		Vegetable.
		Forces of Nature	{	Impalpable agents.
	Abnormal atmos- pheric Conditions.			

It needs no lengthened arguments to prove that the great object of all animal life, in the individual or any single generation as we comprehend it is the propagation of the species, and therefore that death cannot occur from healthy natural causes among even men the highest type of earthly life. perceived as he is of immortality.

much less among the lower
animals that do not attain
to this boon. untill this
work has been accomplished
on the full period of capacity
has passed away. When
after a long well spent life
all the functions of the body
gradually come to a termination,
and death is a simple
result of rest of those nerve
forces, and vital functions
that during the entire period

of life. like faithful sentinels had never for one moment quitted their post. Such a termination of life is more frequently observed among the lower orders of life than among the nature violating animal in the human form. Death from healthy natural causes cannot supervene in any form of life before the period of maturity has been attained

otherwise its species becomes
extinct and the original
object of its creation meets
a speedy termination.

And it may not occur
for a long period of time
after this office has been
fulfilled. This subsequent
period has a duration—
measured by some pecu-
liar and not well under-
stood, laws. Connected
more intimately with

Specific conditions of being,
than with general laws gov-
erning organic position. In
man this latter period is in
well ripened age equal to
the primay, allowing the
period of infancy and the
generative period to be
45 years. and the whole dura-
tion of life 80 to 100 years
giving an average of life
for the perfect physical
organization at 90 years.

When the forces of life may
calmly, and healthily sub-
side into the everlasting
sleep of death. This we oc-
casionally, though rarely wit-
ness in man. and may
be clasified as a healthy
termination of life, — a
healthy death, because it
fully harmonizes with the
demonstrable perfection
everywhere manifest in the
great original plan of

creation, witnessed in
the construction of organic
life in general. and frequen-
tly observed among the lower
orders. While man thus
prolonges his life to double
the period of ~~the~~ termina-
tion of the generative peri-
od. We find the different
divisions of the animal
kingdom extremely
variable in this particular
The Ephemera is born

from the long dark period
of its larval life, of three
or more years spent beneath
the ground, in the evening
to die in the morning, "tarrying
but a night," in the perfect
form. — dying immedi-
ately after the great object
of life is accomplished.

We thus behold two great
extremes in the duration
of life, after this great
natural office has been

accomplished. But by
close observation we may
find these extremes still
more marked between
animals more nearly related
than those already referred
to, as for instance the
following examples compared
with the Ephemeral
insect. I have in my
possession at the present
time, January 2nd 1866,
Several living specimens

of Doryphora 10 lineata say
which spent 30 days in
the larval and pupa state
(infancy), and 68 days in
the active period of Genera-
tion. They have now already
spent 150 days in old age
with a prospect of continuing
alive untill next summer
thus riveling man in
the perfection of their organ-
ization and ~~har~~mony of
vital functions, if the duration

of old age can be taken
as a standard of Com-
parison. and for aught
we can see it is as good
a standard of Comparison
of perfect organization, and
vital affinity as any other
within our reach.

This class of observations
demonstrate one highly
important fact, that there
is a period, peculiar to every
species of animal, at which

with a well rounded age
death steps in as naturally
and as welcome as a
peaceful sleep.

The innumerable hosts
of Bygones Leucoptera
fell a victim to the king
of terrors before this great
period, that of genera-
tion had been reached,
of this I am positive. from
the most thorough and care-
ful observation, and knowledge

of its habits, it therefore
becomes clear that they
were victims of a violent
death — an Epidemic

We must therefore search
for the cause among
the diseased instead
of healthy actions.

Diseases acting on
the Physical organization
from causes within
the body.

Confining our
investigations to this
immediate generation,
with which we have to
do in this discussion
we may conveniently
divide this branch of
our subject into
two classes.

First; - from imperfect equilibrium of the Physical organization and vital functions either hereditary or acquired by some abnormal action a habit of life of the individual. not constrained or influenced by outward circumstances.

Second; - Excesses in the exercise of the appetites and passions.

Just:— that there was not
an imperfect physical organiza-
tion derived from parents
we know from the obser-
vations already briefly referred
to. which we learn from
the favourable circum-
stances under which they
were developed the preceding
year. and from the freedom
of their activity during
every period of their existence
in selecting proper retreats

wherein to pass the Winter,
the natural vigor and activity of life so fully manifested at any time during the winter, when placed under favourable circumstances, and in the spring by discharging every office of their being in the most perfect manner, in providing for all their individual wants, and in carefully surveying the country, true to their

instinct, and in selecting proper localities for the breeding places of their young, and for the period of one month depositing them in the places thus selected.

A careful examination of the young also proved them to be of the usual type. They were in a state of unrestrained nature upon the plants of their parents first choice on which they

from year to year had developed in the highest degree of perfection and for aught the most accurate and anxious observer could by any means of information conclude, would continue thus increasing in perfection perpetually.

The perfection of the vital functions of the parents, is beyond doubting

When we remember the
history of the preceding
winters through which
generation after generation
^{passed} ~~passed~~ increasing in per-
fection and numbers
and that the last winter,
that of 1864 & 5, was one
more favourable from
its unusual mildness
and excellent protection
by snow. The great
numbers that passed through

the winter safely was a result of the unusually favourable protective conditions of the winter.

The functional activity of the parents was still further manifested in the highest degree from the unusual destruction caused to the growing crops in the spring in providing for their own sustenance during the

period of oviposition.
This fact was a matter
of common observation
everywhere, because in
many places the rather
limited wheat grounds
was so filled with them
that the parent insects
destroyed from one fourth
to one half of the young
wheat plants, and no
field within the scope of
my observation but suffered

greatly from this source
never before, in any previous
year, within the period of
my observation and infor-
mation from diligent inquiry
was there such a destruction
of the small wheat plant
in the spring, by the parent
insects. Thus the vital
activity of the parents
was fully manifested
The unusual numbers
of them explains the

fact of the young plants
being so unusually injured
by them

Their reproductive
powers were ample to which
a host of their progeny
readily testified. The young
were developed in the
egg, brought forth, and
for a time nurtured
under the most favorable
circumstances of food
and climatic conditions

A most thorough
and Carefull. general
and microscopic observation
of the eggs from day to day
(during which the various
changes of the developing egg
was noted) and of the
young as they came
forth is the best and
most positive testimony
that can be required of
the normal perfection of
the young in every way.

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Their full normal activity is the most unmistakable evidence of the perfection of both physical organization and vital functions of the young.

From this careful observation of the habits and observed perfection of both larva and imago we must conclude that they inherited both a perfect physical organization and vital

affinity, and that with
favourable surrounding
circumstances could
develop to the highest degree
of insect perfection.

Grades of Appetite & Passions

It cannot be presumed
that these insects in a
state of nature should
all of them, with one
simultaneous impulse
be driven to the destructive

gratification of Appetite
while all previous generations
had no such failings

Papians they had none
to gratify in their simple
state of nature and
undeveloped youth.

We come now to
consider the causes acting
from without that may
have produced the epidemic
that destroyed so numerous
a race of being in such a

brief period of time.

Fast: Natural Enemies

These could have been readily observed, unless they were microscopic. A few Coccinellidae and Crysopa of the species already referred to as preying on them in great numbers in the previous year, attracted my attention, but not in numbers to make any appreciable effect on the multitude.

If microscopic enemies—
were present they failed to come
under my observation, by
examination, and in the
absence of positive testimony
when properly sought for,
together with the suddenness
of the attack, we would
feel no more justified in
imputing the disease to this
Cause than we do the
various epidemics that from
time to time affect the...

higher animals and even
man himself.

It is true that we have
associated with this idea,
that "animalcule tribes"
are the active cause of
epidemic diseases. The
immortal names of
Sinnæus, Sir H. Holland
Dr Keenle, Dr Williams
and a host of others

While we greatly revere
the names and the

works of these great leaders
in science it may not be
inappropriate to examine
their mere Hypothesis by
asking ourselves a simple
question. If these num-
erous animalcula in
the atmosphere gain
access to the blood or other
parts of the system, and
there as is supposed, propagate
their species for a limited period
of time. Why do they not

Continue to propagate
untill the organization
is destroyed? As for Example
the Chique (Pulex Penetrans)
Trichina Spiralis and other
parasitic insects, in the
human body, producing
serious injuries, lameness,
foul and malignant ulcers
and intractable diseases
requiring amputations,
and even destroying life
itself.

Deficient Food

Although this from year to year may cause the death of many of these insects, from the fact that the food plant on which they are placed by the parents always fails if not from destruction, from ripening before the imago state is attained. Yet most of them make safe journeys to abundant

supplies of food.

It is certain that many perish in these long journeys on foot. When the ground was almost literally covered marching in every uncertain direction, many must have failed to find, at least, choice supplies, but accidents of this kind are repeated from year to year, and form part of the natural history of the insect

I have frequently seen
them take journeys of a
week or more in search
of fresh fields & pastures;
when the original supply
failed them, as it does
every year before the period
of Maturity is reached.

It is not with these more
unfortunate that we have
to deal, in our investi-
gations of the present epi-
demic, but with those

owned hosts that offered
advantages for
development fully equal
those of any previous
one. Regarding the abundance
of food; and more especially
the great mass of my
observations were made
in cornfields, close to the
beet, where their natural
food was plenty and of
the choicest kind and which
they were perfectly contented

forwarded hosts that obtained advantages for development fully equal to those of any previous year. Regarding the abundance of food; and more especially where the great mass of my observations were made in cornfields, close to the wheat, where their natural food was plenty and of the choicest kind and with which they were perfectly contented

Perverted Food

I can see no good reason why on this particular occasion more than at any preceding period in at least a number of previous years the natural food plant should become a poison, it must however be admitted that rust mildew &c may have a deleterious effect upon the insects.

at feed upon the grain.
However did not observe
any unusual manifestations
just yet, except a ~~large~~
number of black, smutty,
and blighted heads of
grain.

At the same time the
insects which were not only
migratory feeders on the
adjacent corn, but some
that from the larval
state had fed entirely on
S.

Sweet corn, and that
were objects of my special
observation. With a view
of determining other facts
in their natural history,
met the same fate.

From this we therefore
conclude that the food
was neither perverted
nor so materially poisoned
as to be the efficient
cause of the disease.

Social Causes

Of the social causes of death of the animal body the first, Warfare belongs to a more noble race of beings, and is a business of a more exalted character than such insignificant creatures are permitted to enjoy.

We then have only to inquire into the effect of the social compact as developing

Animal Poisons.
as is well known to be the
result of overcrowded ten-
ements. Ships, cities and
encampments developing
Malignant Typhus and
other fevers. Cholera &c. as
was supposed in the late
origination of Cholera,
from overcrowding, filth,
and decomposing sacrifices,
among the pilgrims at
Mecca. and various

other epidemic diseases.
with which the world
has been scourged from
time immemorial

The cattle disease
now raging in Europe
is another marked example
of the development of
epidemics from animal
poisons, originating as it
did in the poorly ventilated
stables of northern
Russia.

These insects however
were entirely in the open
air, and thus enjoying
the freest purest breezes
that the wide open
prairies of Illinois
could afford. The high
as well as the low lands
were successively swept by
the same beneficial influence,
Furthermore those to which
I already alluded as feeding
on the sweet corn in the

Billiager were at the distance of about a mile from any great number of them in wheat fields, and these not very numerous, so that the pestilence which at the same time attacked them also, could not have originated among these few in the corn from animal poisons. and could not have been communicated from the

neighbouring fields.

The more improbable
does it appear that the
entirely efficient cause of
the disease could have
been animal poisons
from the presence of num-
bers. When we reflect that
other insects in the
immediate vicinity were
entirely exempt from
disease

I also have good reason

neighbouring fields.

The more improbable
does it appear that the
entirely efficient cause of
the disease could have
been animal poisons
from the presence of num-
bers. When we reflect that
other insects in the
immediate vicinity were
entirely exempt from
disease

I also have good reason

for supposing that other
insects in remote localities
were affected in a similar
manner, two other species
at least which I will
notice hereafter.

I also observed other
species of insects passing
through the same social and
climatic influences entirely
exempt, one of which a
very remarkable incident
may appropriately be mentioned

In the very same corn
during the height of the
epidemic. Aphids appeared
in such countless numbers as
to entirely cover the top of
and more tender parts,
developing with amazing
rapidity at the same time
when the Bygones Leucoptera
were suffering the most severely
from the plague.

Many other insects were
in the fullest enjoyment of

health in the same regions,
and upon plants fully as
liable to be diseased.

These facts are worthy
of consideration. and may
lead to important prin-
ciples in nature — truths
having a direct bearing
on the laws governing
the animal organization.
Either demonstrating that
all are not subject to the
same influences, or that

one species of the same
clap of the animal kingdom,
destined by nature to inhabit
the same climate and feed
upon the same or similar
plants. has superior powers
of endurance over another,
or what is still more prob-
able, a proof of some
powerful and wonderful
effect developed by some
apparently very trifling
circumstances.

The Aphid was located
on the tops of the corn
while the L. leucopterae were
near the ground and
happed the night. and cold
days on the ground, only
the more nearly matured
ones being ever found above
the middle of the stalk,
and thus not so freely
exposed to the light and
warmth of the sun and
Equilibrium of the atmosphere.

And above all this what
was far more important
still, the Aphid only appeared
after the Epidemie had
passed the climax among
the L. Leucoptera, and
although the epidemie
was still raging with
great violence, yet the
inducing cause may have
so far subsided as not to
effect a new set of healthy
beings introduced among

them at this particular juncture. It certainly was extremely interesting to behold the aphids in such great numbers, in all stages of their development, enjoying life apparently in the highest degree while the L. leuceptera, insects of the same order (Hemiptera) and feeding on the same plant, were perishing beneath their feet, from the influence

of some potent invisible
Cause. The aphidizing
of a more delicate organ-
ization it would be expected
that under the influence of
the same causes the effects
would be more readily
manifested. Its method
of securing nutriment is
the same. by piercing the
plant with an approp-
riate proboscis. and sucking
the juices. It develops to

maturity with a much
greater rapidity and in
this respect alone does it
appear most material
to differ in its general
habits from S. leuceptera
yet we here see the one
developing to maturity in
a perfectly natural manner
while the other immediately
beneath it, on the same
plant is dying with a
fatality unparalleled in the

history of animal life,
unless we admit the supposed
universal destruction of all
animals, at the close of
each Geological period.

This very remarkable
phenomenon, might appear
very difficult to comprehend
by a single observation. But
when we follow the subject
daily during a long
period of time, as we always
in all cases should do to

make an approximation to a reasonable conclusion, then that which might appear very obscure under a single observation, appears surrounded with fewer difficulties, as we hope to be able to demonstrate in the proper place.

As the *Sp. his* appeared toward the close of the Epidemic among the

S. leuceptera. their wonderful exemption might lead us to ask ourselves the question. With a good deal of propriety, are the now dying S. leuceptera, suffering from the effects of a cause that has nearly passed away? We have good reason for thinking that they are. We well know that the seeds of a disease sown, and finding a lodgement may be

"gathered many days hence"

The impress of the poison
being so malignant that
there was no escape from
its effects even after health-
ful surrounding conditions
were established. And
furthermore, it is one of
the rare opportunities
that we enjoy of demon-
strating that even insects
are subject to sickness per-
haps occupying long periods
of time as well as man.

Climatic Causes

The consideration of the climatic causes that may have been productive of this epidemic is the most difficult as well as the most important part of our investigations. here we have embodied the cause, after which we are searching. but at the ~~onset~~ we encounter the same difficulties that

have always envired
the investigation of the
mysterious causes of many
Epidemics that have visited
the Superior race of Earth's
inhabitants.

But having clearly Elim-
inated all the preceding
causes. Capable of indepen-
dently producing death, in
their application to this
Epidemic, we proceed con-
fident that if we do not,

Succeed in clearing away
the veil of mystery that
surrounds this department
of pathology. We still have
here the concealed cause—
"the diamond in the mine"
To remove it many able
minds have laboured in
vain. and another failure
will but be adding one
more effort to the field
of fruitless speculation and
ultimately to the great ocean of
oblivion.

Vaporized Poisons

First, those of a mineral,

Second, those of a vegetable origin, have been classified among the diseases producing and consequently among the death causes.

The former is circumscribed in its effects, in the popular acceptation of the term Mineral to the localities of mines, manufactories &c. (Although all things inorganic strictly speaking

do.

are minerals, air & Water included,) and in that sense only are we required to consider them for our present purpose. They were not in proximity and consequently not the cause of the Epidemic or were the "waters medicated" by the Divine power for the purpose of destroying them. Believing, as we do, that the Supreme Author of all things has implanted

a higher law in nature
than that of Special interference
A law perfect in itself, — a
law that produces the effect
from the cause, in all the
working plans of the Universe,
with an unswerving course,
as truly, as perfectly, as
rapidly, as the ponderous
wheels of time. Roll steadily on,
— A law that is the perfection
of all laws. — a law that
needs no revisions, repeals,

or amendments and
special interferences, - a
law that confers the
highest glory upon the
great Originator. and in
the best possible way, serves
the various purposes of all
his Subjects. we cannot
with a commendable
zeal to arrive at the
truth, allow the conclusion
to rest on so improbable an
hypothesis.

Second, — Vegetable Poisons
floating in the vapour of
the atmosphere. Upon this
as a cause of disease and
death many able Essays
have been written. Still
a dark cloud of mystery
envelops the subject.

But gloomy as these mists
appear let no one falter
in his attempts at investigation
or hesitate to add another
whisk to the breeze that at

Some time in the future will
have so accumulated as to
scatter the curtain of darkness
that so effectually environs this
department of Pathological
research.

It is a well admitted
fact that a certain mysterious
agent, is in some way developed
by, or connected with dead
vegetable matter. Subjected to
certain conditions of temperature
and moisture, does produce

disease and death of the
animal organization. espe-
cially man. This with as
much of fancy as demonstra-
tion has been conveniently
styled Zoimotic poison —
a ferment. which though
not observable is ranked with
the same class of agents in
nature, as the yeast plant.

It is thus very convenient
in various other departments
of science to have some mysterious

explanation of that which
we do not know — a "scape
goat" by which the man of
scientific pride, who would
give some explanation for
every result, can obscure
his ignorance. It may
however be pleasant and in a
measure satisfactory to have
some explanation of the
mysterious agents and oper-
ations in Pathology
Chemistry, Medicine &c.

however erroneous and unfounded they may appear to be in the sunlight of future discoveries

How many chemical and perhaps mechanical phenomena in the body and out of it. Not well understood are explained by the so called catalytic action.

As in the use of Mercury in the human body, it has had a long and generally popular

use. Certain desirable results
frequently follow its judicious
use. Yet ask the wisest of
Medical Philosophers how it
accomplishes the work, and
instead of simply saying he
does not know, he tells you
it is by Catalytic action, and
perhaps a theoretical explanation
without a demonstration.

To this there can be no
serious objection while it does
not prevent us from prosecuting.

our investigations. ever
keeping before our minds the
fact that observation will
in all cases, in due time,
lead to all truth. and every
true observation, however humble,
should be brought forth as an
aid to the Philosopher who
at some future time may
eliminate the truth.

Observing, seeing is the only
way of knowing, is the only reli-
able foundation of correct reasoning.

This imponderable non cog-
nizable agent in marshy
districts is. denominated
effluvium, miasma, malaria
bad air, aerial poison, fungus
growths, microscopic plants &c.

The degree of success that
has attended these explana-
tions is evident in the fact
that as much obscurity veils
the truth as when they were
first proposed. When this we
will only entertain a few thoughts

in connection with this
division of our subject. Refer-
ing for a more complete
discussion to the proper
place in a succeeding
Chapter.

We find among leading
authors two principal theories
to account for the production
of a peculiar effect upon men
and even animals, at certain
seasons and localities when
heat, moisture and decaying

Vegetation are present.

First — dead decomposing vegetable matter, in imperceptibly minute division in the Atmosphere.

Second, — living infinitesimal fungus growths, somehow impregnating the atmosphere.

If either or even both of these theories are true, have we still in them an efficient cause for the epidemic of 1865 among Sygaenus leucoptera,

In the first place as
heretofore observed we find them
affected on the high as well as
the low grounds. although later
in their season on the highlands.

When we consider that some
other species of insects very
numerous did not suffer from
the same cause. we do not find
here an explanation entirely
satisfactory to the adoption of
the hypothesis. without a more
mature consideration.

It is a well attested fact
by everybody throughout the entire
north west, and long to be rem-
embered by many that Mosquitoes
(Culex pikiens) were not seriously
injured by this or any other
disease, except want of "mae blood",
during the summer and autumn
of 1866. and of that they man-
aged to secure more than con-
tributed to our comfort.

Now, as is well known, they
were developed on the lowlands,

in marshes &c. where they
would become exposed to
these miasmatic influences in
the fullest degree possible, first
in the larval state in the
water, where the miasma may
be supposed according to the
best authorities to be most
plentiful, and secondly in
the mature state they are
found more abundant in
these malarious localities than
on the high lands.

even Chicago itself not excepted.

and for all that I was
able to observe enjoyed a
degree of health that was
quite annoying, even with
the slight acquaintance that
I formed with them. Many
other examples of a similar
character might be produced.
While on the other hand he
found something operating
determiningly on not only L. leucosternus
but many other insects. among
which he will only refer to the

larvae of Galeruska vittata
and Saehnosterna fusca,
coleopterous insects. both of
which were less destructive than
in the summer and autumn
of the previous year, as they
were abundant in the spring.
there is no good reason why
they should not have developed
with an abundance of food,
during the summer, inpro-
portionally with the previous years
Especially the Galeruska vittata

that matures at least two broods
in a season. except the
unfavourable climatic influences

In the extremely wet weather,
and consequently great decomposition of vegetable matter,
we find causes that from
the commonly received opinions
may have produced the epidemic
among these insects. but at
the same time if we admit
that the disease was produced
by the miasmatic, or

the parasitic influence. we
impelled with the fact that
other insects no higher in the
scale of being were entirely un-
affected.

If miasma—mala-
ria was the cause, then the
question forces itself upon
our consideration. why was
the mosquito thus not only
exempt, but at the same time
developed in an unusual
manner, insomuch that
they were a source of —

annoyance almost beyond
endurance, in many localities,
and these localities were the
very places where the malarious
influences are most manifest
among men. as along the
marshes and sloughs on the
Mepisihhi river bottoms, there
the mosquitoes became so
abundant that there was
no rest for man or beast
either day or night. These
reminding us forcibly of the

annexances on the banks
of the Orinoco and in the
valley of the Amazon in
South America.

These infested localities
especially in the middle and
southern parts of the State
were greatly affected. at the
same time with the mal-
arial influences.

When we examine their
physical organization. we
find many points of similarity

The highest as well as
the lowest animal or-
ganizations are generation
after generation. developed in
the same manner from
the union of parents similar
to themselves. alike depend-
ant upon food. and the
common laws of life. diges-
tion. and assimilation
Similarly affected by the
imponderable agents. light
heat and electricity.

a normal presence of each
being in the highest degree essen-
tial to their development. While
a great excess or deficiency in
all cases. Without regard
to type. produces death, thus
they are all governed by
many of the same laws
that govern the production
and sustenance of vegetable
life. in these main roots of
organized life the animal
and vegetable kingdoms are,
w.

firmly implanted.

We see that in all the more essential conditions that govern the organic being the highest and the lowest animal organizations are upon a common plane.

Originated alike in Embryo developed alike in youth, propagating in a similar manner their kind at maturity, and all descending alike into one common

and unwelcome grave.
Each struggling with all
its powers to maintain
the life it enjoys untill the
last possible period of duration.

When we thus reflect on
the great general laws that
prevail among these different
forms of organized beings,
in every department of life,
the nature of which we are
conversant with, is it not
more that we should attr

ourselves are they not sub-
ject to the same pathological
laws also. Then are they not
subject to the same laws
that direct the forces of this
unknown agent called
Malaria. If in every
condition of life with
which we are acquainted
they are governed by the same
laws. Would it be logical to
suppose. in this one unknown
law that they are not alike

Subject to the same general
principle? would it be reason-
able to suppose that they are
not in the presence of this.
hypothetical something
called malaria governed by
a law of equal uniform
application, so far as life
grade will permit.

The very material difference
presents itself for our con-
sideration. The difference in
the blood of different claps

of animals

The present state of our knowledge of the action of the malarial poison in the blood is, that in a very remarkable manner it reduces the number of red capsules. Hence to some extent all animals having red blood, due weight being given to their susceptibility. powers of endurance, resistance and exposure

may become directly or indirectly influenced by this malarial agent.

But when we descend to the type of beings having white blood, we have no ^{guide} except reason and our own observations, the literature of the subject being very scanty. The diseases of white blooded animals up to the present time not having claimed much of

the attention of Pathologists.

This may be, by many, considered a subject of very trivial importance or unworthy of notice, but to the true medical philosopher, every thing connected with the great problem of life, is worthy of the most careful consideration. The Pathologist here may find an open door to the demonstration of truths.

that heretofore have remained
in utter obscurity.

Guided by reason and
years of close observation. and
study of the anatomy and
Physiology of insects we
must conclude that they
are in many respects subject
to common laws in rela-
tion to health and disease,
and that if one is affected
by the malarial poison
every other of the class may be.

That it really does or does
not affect white blooded
animals we do not know.

We do know that it
has a marked influence
on the red corpuscle,
whether as a primary result
from which the disease
becomes manifest, or from
its first affecting some
other organ or function,
and thus secondarily affect-
ing the red corpuscle.

are not prepared to say.

With our present knowledge, we can hardly admit that any other than red blooded animals are materially and sensibly influenced by the Malaria.

Close observation of insects and some of Malaria, at least, fails to give us any evidence that such an effect is produced. but on the contrary we have much to

aprove us that such is not
the case.

Then as we can come
to no other conclusion than
that the same malaria
which if it really influences
one member of the great
family of insects influences
in a similar manner,
every other member, the power
of resistance &c. being held
in consideration as temporary
modifying causes.

Admitting then if we may
for the purpose of arguing the
question of a malarial poison
as the cause of this Epidemic
can we reconcile the apparent
inconsistencies that arise.

Why did one species of the Hemich-
tera. Syngaeus leucoptera. suffer
so terribly from its presence,
while another species, of the same
order, the Cephus already alluded
to, developed in such great and
unusual numbers at the same
O.

time as well as hosts of others left
numerous species of the same order.

Among Coleoptera why were the
larva of Galeuska vittata and
Bachrosteina fusca feeding on
the ground material injured by
this or some other agent. While
Daphnia 10 lineata, Rhinoceros
seniphar, the Cantharides,
Lytta vittata, L. cinerea & L. atrata,
Chrysomela polyzona. The
various species of Coccinillidae,
and Brachelytra, and a host of

others very abundant insects
were enjoying the greatest immu-
nity.

Of the Lepidoptera why
were the Linea Pomonella,
the Thinx quinquemaculatus
and many others so greatly
reduced in comparative numbers
although in the previous year
they were tenfold more abun-
dant than I ever before
observed, and in the spring
and early summer, I saw in

a state of nature more of the
imago of L. pomonella than I
had seen in all my life
before. and in the early spring
I can say the same regarding
L. quinque maculatus. The
question urges itself with great
force upon our consideration
why were L. pomonella with
such an army of progenitors
no more abundant in numbers
of the larva than in the proceed-
ing year. and above all why

were the L. quinque maculatus
so wonderfully decimated like
Sygmaus leuceptera that not one
reached the full grown larval state
to a thousand of the previous year.
While at the same time many
others especially the Noctuidae de-
veloped to the perfect state in
the greatest abundance.

Thus we might continue the
comparison at much greater
length, among all the distinct
orders of insects. With many

unanswerable questions that arise. on the supposition that the so called malaria was the entire cause of the Epidemic.

If we suppose that the malaria instead of being evolved by the decomposing vegetation in marshes. is as many suppose, due to minute fungi produced in the dew, fog and vapour of the atmosphere. developed in the night. so small as to be beyond the reach of

the microscope. and dicing
in the light of the morning Sun,
we still find ourselves in the
same dilemma. in attempting
to weave for ourselves a satisfac-
tory answer to the question,
that arises for our consideration,
in connection with the subject
of malarial poison as applied,
at least, to this particular
epidemic

Even if this sub-micro-
scopic fungi theory were capable

of answering the conditions of
the question at issue. would it
be consistent or proper, in
the first place, to conjecture the
distance of the fungi. In
the second place to assume
that these fungi are only
in the locality of Marthes
and that the spores are
not driven in the winds to
distant regions. while we
know that other and much
larger brytogamia, visible

to the naked eye, are at all times represented by these spores everywhere, awaiting a proper receptacle for their development. Mushrooms, toadstools, lichens, mould plants, and the various fungi are abundant everywhere. Must they not enter the lungs in great numbers at every breath. Yet we are not conscious of any deleterious results, and in the third place after

having assumed the presence
of these submicroscopic fungi,
it becomes necessary to assume
their poisonous character. Thus
we have at least three complete
suppositions for the purpose of
hiding our ignorance. Each of
which when compared with
the test of known objects of
the same class of the vegetable
Kingdom, does not concur with
any thing with which we are
familiar. We cannot see

them with any power of the
microscope at our command.
When we have constructed
our imaginary plant, we find
it necessary to suppose the
existence of a distinct,
and separate law for its
diffusion; and that the
ordinary atmospheric laws
do not exercise the usual
control over it, wafting it to
every portion of the earth, and
lastly we have been compelled

to construct it of a far
more deadly poisonous character,
than any other tangible member
of the cryptogamia. Each of
which hypothesis, to say the
least, is unreasonable, and
after we have it, we have
found above, that it will not
answer all the requirements
necessary to fulfill the conditions
of a miasmatic poison. That
operates upon the animal
organization, as an agent

that we can raise to the
rank of a general disease
producing cause, in every
department of the animal
Kingdom.

The same argument applies
with equal force against
the cherished hypothesis for a
vegetable origin of the various
causes of the Eruptive fevers,
a full discussion of which we must
defer untill we have completed the
consideration of this division of our subject.

Forces of Nature

The forces of Nature proper. Ultimate
to the vaporized portions, are
Capable of developing effects
far more potent perhaps than
we are capable of estimating,
in the present state of Science.

The three imponderable
agents light heat and electricity
to which it may also be found
necessary to add a fourth, the
so called all prevailing Ether,
are conditions of the highest

vital importance to the development and maintenance of the organic being.

Without light the organizing forces are of the lowest order, and imperfect in development. All life in its origin and perpetuation is entirely dependent on the vitalizing influence of the rays of the Sun. (which many so sedulously exclude from their dwellings with blinds & curtains).

Only plants and animals

of the lowest types flourish
at all successfully in dark
situations, and we have good
reason to believe that in perpetual
darkness, with sufficient warmth,
the vitalizing forces would soon
cease entirely, and all life
become forever obliterated.

The higher organizations,
vegetable as well as animal,
are very readily influenced by
these circumstances.

I have frequently measured

the growing vine in a warm
summer day advancing seven
inches in 24 hours. of this,
six inches grew between the rising
and the setting sun. leaving
but one inch for the entire night
and this grew in the twilight
and early evening. under the
remaining vitalizing influence
of the departing light. in the
morning the growth had
entirely ceased. to be renewed
again by the rising sun.

Now if the light of a day
be modified by clouds, or if
it be cold, the growth would
be much less. often, in midsum-
mer, not one fourth as much
as in clear light warm days.

Who is not familiar with
the effect of partial darkness
— that perpetual twilight,
on vegetable life, in damp
pits and cellars, as demon-
strated in the feeble growth of
potatoes &c. under the partial

Stimulating influence of
the scattering rays of the
sun. This effect is much
more marked in the young
growing, than in the already
mature plant. It is so even
in a higher degree with
insects and all animals
of the higher grades of organ-
ization. In all ages of the
worlds history from the earliest
dawn of life we find the
evidence of the vegetative force

as the forerunner of the
animal, and existing under
more primitive circumstances

We then here hope to find
one of the auxiliary causes
of this great epidemic among
insects. The very season of
their greatest need for the
fullest influence of sunlight,
was one of unusual dark-
ness. day after day, it was
wet, and mostly cloudy
for a period of three months

June, July and August
just in the season of their
development. Hence the
vitalizing force was of a
lower grade, the animal-
ized cells, being developed
less perfectly, are less able to
maintain their organic
identity in opposition to
any disorganizing force or
incompatible contingency that
may arise.

This view of the subject also

gives us a very plausible explanation of the comparative exemption of all these species, feeding on the tops of vegetation, already alluded to and the destruction of others

The Sygaenus leucoptera especially in the larval state feed near the ground, and even on the root of plants, and therefore were less exposed to the light of the sun and more to the cold and dampness

of the season. than insects
on the tops of vegetables.

By way of a more thorough
experiment. I had a few acres
of barley, at full height, contiguous
to a cornfield. ploughed under,
with the millions of these
larva, feeding around the
roots. The heads of the barley
projected from beneath the
furrows. the extreme wet
weather preserved the life of
the grain for about three weeks.

and to my surprise great numbers of these insects continued to live and develop under those exceedingly unfavourable circumstances. at length this supply failing them, those still alive resorted to the neighbouring corn. these were among the first to suffer from the epidemic on the highlands. They were as effectually exterminated, early, as those already referred to on the low lands.

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While those on high lands
under the more natural con-
ditions, were able longer to resist
the influence of the Epidemic
Causes — were attacked later
and of these a few escaped
the overwhelming calamity.

On the contrary Goryphora
lineata feeds on the tops of
the potato plant, on the very
top of the stem and leaves,
especially as I observed them
during that wet season.

and therefore enjoyed more
of the sunlight. and freezes,
and less exposure to cold and
dampness during the day.

The same is true of Chrysomela
holynia already referred to, and
many other exempt species.

While on the other hand the
larva of Saichnosterna fusca
and Galerita vittata feed
on roots, just beneath the
ground, and develop in a
season when for a greater

portion of the time the surface of the ground for an inch or two is dry, freely impregnated with air, and under the direct influence of the sun light and warmth.

But in this unusually protracted season of cold and wet may we not have one of the efficient causes of their deterioration. Furthermore I observed the larva of G. vittata feeding higher up on the root than usual, when

above the surface of the ground,
a thing which I had never seen
before during seven years of close
observation of their habits. This
deviation from their usual habit
of feeding entirely beneath the
surface of the ground. doubtless
was to secure more of the sunlight
and warmth, than their nat-
ural feeding place afforded. and
is conclusive evidence that the
conditions essential to comfort
and life were interfered with

and that these conditions were more nearly fulfilled on the surface of the ground, although the stem is not so naturally their appropriate food as the root. An humble evidence of making the best of inharmonious circumstances.

HEAT

another condition within proper limits. essential to the development of all life was here also reduced below the

normal standard for the
favourable development of
these insects. and also had
its effect in reducing the perfec-
tion of the vital organization
below its normal condition as
they were developing. and
was another of these circum-
stances that prepared the way
for the ultimate Epidemic.

Electricity that
wonderful force so intimate-
ly connected with every surround-
ing

object is probably far more intimately connected with the great and mysterious problem of the creation, development and maintenance of the organic structure, than the more profound and scientific researches of the philosopher will admit in the present state of science. or even with the most exalted imagination conceive. Many circumstances interfere with its normal

development. Among these may be placed Clouds obscuring the light of the sun for long periods of time.

The sun develops currents of Electricity that traverse the earth from east to west.

These currents are greatly modified by the conditions of the atmosphere. as extremes of wet cloudy weather diminish the intensity while fine dry weather increases the

intensity of the Electrical
current. We therefore have
here at the same time corres-
ponding modifications in the
development of ozone — an
intensified form of oxygen.
which is very essential to
the maintenance of the in-
tegrity of the organic structure.

This vitalizing force being
diminished as well as the
stimulation of the Electrical
current not being manifested.

in its usual quantity, or
intensity. We have another
cause of the diminution of
the vital affinity, and
consequent impairment
of tonicity—vital adhesion
in the cells of organic life,
and consequently one of the
direct causes, instrumental
in developing this Epidemic.

Abnormal Atmospheric Conditions

The atmospheric conditions are very important elements of health and disease.

A dry climate with little carbonic acid gas is the best for the perfection of the animal organization.

The reverse is true of the vegetable kingdom. of this we have abundant evidence in the luxuriant and tangled forests of moist tropical regions.

and in the gigantic ferns
of the Carboniferous era.

These wet seasons facilitate the decomposition of vegetable matter, and sets free unusual quantities of carbonic acid gas, which operates banefully on the animal system, in proportion to its increase.

The presence of an unusual quantity of watery vapour in the atmosphere

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is another very efficient
cause of inconvenience
and disease to animals.
it prevents the freedom of the
respiration from the skin,
so essential to life, and
materially interferes with the
breathing apparatus.

Statistics prove that large
bodies of water, with cold
are fruitful causes of
lung diseases. Rheumatism &c
while high, dry, inland. Warm
No.

districts are comparatively free from the development of these diseases.

Now in the case of insects that have their lungs ramifying through every part of the body, with their imperfect blood circulation. We probably have here a more efficient disease producing cause than in the higher organized animals. The ripicles of watery vapour, condensing in

the spiracles and minute
air cells of these insects
must greatly interfere with
the proper oxidation of the
blood. and in the S. leucophaea
we have an insect living on
& near the ground at a time
in the year when the ground
is much colder than the air,
and consequently their bodies
of a temperature corresponding
with the ground night and
day. as very many of the days

as we have seen mere hunks.
The atm.osphere being
warmer than their bodies, and
loaded to saturation with
vapour would, at every
inhalation, produce a conden-
sation of water in their
air passages. this continued
for many days and nights
in succession would seriously
interfere with the essential
blood purifying process.

This insect also feeds on

the sap of the plants,
and therefore the more needs
the evaporating influence of
a warm sunshine. and a
dry atmosphere. than such
insects as feed upon the
more solid substance of plants,
as the larva of several insects
already referred to as being
prominent examples of the
exemption of a tender larva
from the same epidemic.

Hence as the season advances
Ced

we saw the epidemic raging
more violently when the
atmosphere became warmer
and still more densely hei-
ghted with watery vapour
while the earth and necessarily
the bodies of the insects still
remained cool. The air pas-
sages must of necessity become
clogged with condensed vapour
if not entirely filled with
water. The blood is less
perfectly purified, in preparation

as the water in the air
cells and paperges becomes
more abundant.

The vitalizing force as we
have already seen greatly deterior-
ated by the deficiency of the
creating power of the sunlight
and heat. the lack of ozone
and diminution of the necessary
magnetic stimulus. the absence
of tonic in the already existing
cell molecules, and an imper-
fect blood plasma from which

to elaborate the proper life organization; are influences under which we find the cell structure built up more and more imperfectly.

The blood becomes poisoned with deteriorated organic materials. Near sick and emaciated the insect at length dies.

From the argument produced especially that which demonstrates that the trachea

and air cells of the insects
were closed with condensed watery
vapour it may perhaps be
supposed that the cause of
death was purely mechanical—
a mere clogging and filling
of the air passages. so that
they died of asphyxia. and
that they were not therefore diseased.

That a low state of vital
affinity or vital cohesion. if
we may so style the peculiar force
that holds the atoms of matter

with the power necessary to the
persistent maintenance of the
organic structure. in the midst
of the opposing elements; must
have existed we know from observa-
tions of all the phenomena,
bearing upon the question.

It certainly was not the
mere presence of wet and cold
that exhausted the life sustain-
ing forces. As we have already stated
the severe cold wet weather that
the parents passed through on the

Damp Cold ground of Spring
was not productive of any
such results: like exposures are
to be observed every Spring, and
no such detrimental results
occur. The simple reason is
that a well developed healthy
organization, — a condition of
vital affinity where the organic
cohesive, and the vitalized forces
existing in every cell are perfect;
is capable of enduring more
of the extreme vibrations of the
S.

great pendulum of life
favouring and life maintain-
ing conditions than the low,
depressed, deteriorated, imperfect
State of Vitality that we have
found to exist in the objects of
our consideration.

This low state of Vitality, is
in all essential conditions the
same whether it was induced in
a previously healthy organization
or as in this case, thus developed
by the chemico-physiological forces.

as the organism was constructed. With this low degree of vitality the performance of the necessary life functions soon were interfered with. accumulations of effete matter in the system followed, upon the slightest provocation. The unfavourable conditions continued. The disorganizing tissues were not repaired as they most abnormally could not be. With this low degree of vital power, during the continuation of

the unfavourable surrounding conditions. From imperfection in organization and function, deep seated irreparable disease became established, without the interference of any foreign poisonous matter. The peculiar laws of nature surrounding and governing the functions of the organism, engaged in the maintenance of the life forces, having thus departed from the normal and essential life conditions, we find a

deterioration of the already low
vitalized cells. from the condition
of life, to the other side of the
great dividing line between the
vital and the dead condition
of organic matter, with an
abnormal rapidity. hence we
have the poisonous effects of
excessive quantities of effete
matter in the system. remaining
so long as to undergo decompo-
sition. whence we have the failing
sinking, and collapse of death.

Thus from these circumstances
we can see the production of an
epidemic among a race of beings
with a negative state of vital affinity.
While the same agencies and
circumstances influencing the
same individuals, under the
protection of a positive state of
vital affinity, would have pro-
duced no harm or serious
inconvenience.

The lowness of the type of
organization is no exemption

from disease. however low
the organization compared
with the higher types of life there
is still a great elevation above
the mineral world. Where we
find an organized living cell
capable of reproducing its kind
there may we find a standard
of disease as well as health
- of health while the proper relation
of atom to atom is maintain-
ed. and all the functions
of life are properly performed.

Of disease. When the Chemico-Physiological forces, are no longer able to remove the disintegrating materials, as atom after atom dies in the cell structures, at every vibration of the organic pendulum, and to repair the breach with material newly impregnated with the dynamic forces of the life giving power.

We are convinced that the Cause of death was truly a general disease of organic structure

a vital affinity. and not a
mere mechanical obstruction
producing asphyxia. this becomes
plain from the consideration of
the fact that they were not all
prostrated at the same time,
but died successively during
a long period of time. as the
functions of life gradually yield-
ed to the destroying forces.
Those which from the many
varying circumstances were
in the condition first to take

the disease were first carried away. thus the disease propagated among them during a protracted period of time. in precisely the same way that human beings are struck down one after another by epidemic diseases, those in low, damp, unfavourable localities were first swept away. also those under unpromising circumstances from any cause. as for example those ploughed under the ground

and compelled to live for a long time in those damp dark situations, even as it was on the high rolling prairie.

These circumstances are demonstrative that the agent, working among them, was not merely of a miasmatic character, of indeed any cause except the ever present essential forces of nature. light heat Electricity food. air and water. in their various modifications, were instru-

mental in producing the
wonderful result.

We have thus shown that
the disease was produced by a
combination of causes. many of
not all of which were modifications
of Natural laws. — laws which
acting under different degrees of
intensity and circumstantial
conditions are capable of devel-
oping the highest degree of health.

We may here find a demon-
strable law for the development of

disease as well as for the
creation of worlds and their
products. The Astronomer finds
a mathematical law not only in
the government of the revolutions
of planets, suns and systems
but in the creation of worlds
innumerable. the Botanist
in the structure of plants, the
Zoologist in the physical organ-
ization of the animal kingdom
the Chemist in the combination
and the Mineralogist in the arrange-
ment

of atoms. the Philosopher in
Cohesion. repulsion. inertia
attraction. refraction. reflection
radiation. undulation. Polarization &c.
and the Geologist. in the develop-
ment of life, and the perfection
of the Earth throughout the
entire formative period of our
planet. &c &c

If thus every department
of Natural Science is based
upon a mathematical
foundation. May not the

Pathologist also find a mathematical law for the government of every disease, based on modulations and combinations of the essential laws of nature.

In light, heat, Electricity, food, air and water with their usual impurities, Hereditary vitality and age. We have the essential elements of health in their normal relations.

But when these normal

relations are modified as each one of them may be, in any degree. Varying between Zero on the one hand, and perfection, even infinity on the other, have we not, according to the laws of Permutations, the most endless variety of Combinations, and Causes of disease, without searching for abnormal agents, or special Providences, for the explanation of the Cause of every epidemic or

a other disease. that develops.

With this view of the subject,
it becomes as plain as the
laws of nature are immutable,
why disease is the unavoidable
law: and perfect continued
health. and eternal life in the
flesh. the exception even to an
improbability. This would be
a pleasant subject to follow
at greater length but must be
abandoned. at present in this
Connection.

Among the probable Causes
most efficient as agents in the
production of this great Epidemic,
that involved the ruin of a race
of beings that for numbers, far
outweighed all the human beings
that have lived on this planet,
for the past 6000 years, together
with all that will live during
the next 100 000 years.

We have found,

- 1st. Deficient light
- 2d. Deficient heat

- 3^d. Deficient Electricity
 - 4th. Excessive Moisture
 - 5th. The Earth much colder
than the atmosphere
- all combined during the season of
their development.

I have thus endeavoured
faithfully to narrate what
I considered a very important
observation in the economy of
nature, and to give my views
of the pathological conditions
and cause of the Epidemic

among these insects.

Beyond this we have not attempted to proceed in the classification of the disease, being content with states and conditions. We will refer the constitution of a name for the disease to other investigators. Those curious to know the names of the prevailing diseases among men during the height of this epidemic, August 1865. Can refer to the "Chicago Medical

Examiner Vol VII, No. 1 and
institute such comparisons
as they prefer.

I had hoped when entering
upon this Essay, to find time
and space for the discussion
of other epidemics among
animals. and to glance at
those Epidemics, that have
heretofore, only, been considered
worthy of notice. by writers on
this subject; why?, I am not
able to comprehend; true

they are associated with the
life of our race. This is the
strongest argument that we
need to move that epidemics
among the race of human
beings so personally interesting.
yet when we look around us
as naturalists. and behold
that all our sources of profit—
moneymaking, the all engrossing
theme of $\frac{999}{1000}$ of our race, would
in a very brief space of time, be
swept away by the insect

hunger, in their multitudinous
farms. Yea more. famine and
its accompanying pestilence
would desolate the land before
the period of even our short lives
should have been measured. Need
it not for just such magnif-
icent epidemics as I have narrated.

When we look at these things
I am surprised that so little
attention is given to such
important results, results
that hold the keys of our lives

our fortunes and on all.
Yet truly such have always
been the imperfect notions of
men. the maps even failing
entirely to notice such "trifling
things". and those who do
observe them, not deeming
them worthy of comment.
We find the public journals
filled with accounts of the
great Cattle disease in Europe
from which England alone
has lost \$2,000,000.00 but

none of them even condescending
to mention so trifling a thing
as a disease among insects.
that for the past 20 years have
destroyed property in the valley
of the Mississippi worth from
\$5,000,000.00 to \$100,000,000.00 ^{annually,} w. n.
and even threatened to ravage
the entire north West.

In some of the journals also
we notice remarks that
abundance of noxious insects
are forerunners of Cholera &c.
No.

While in reality the reverse is
more nearly the truth.

We often observe that in
hot seasons insects are
much more liable to disease.
Who has not seen the com-
mon house fly afflicted with
abdominal disease, in
summer seasons. the abdomen
even bursting open and ad-
hering to any object upon which
the insect may be crawling.
While it is yet alive and struggling

to become free. This was a
common occurrence, years ago,
along the Atlantic coast, and
regions east of the Alleghany
Mountains.

But as I have already
so far transgressed the
limits proper for this essay
we must defer the further
consideration of this subject
for a future essay.

